

Sheet (4)

- 1- Explain Ladder Diagram Programming Restrictions.
- 2- Explain with ladder diagram how the pus button switch can be used as a toggle switch with two functions: on and off.
- 3- Draw Ladder Diagram for the following operation:
In a motor control system, one master stop pushbutton (Stop-PB) is available for stopping the operation at any time. If the temperature switch (TSW) is closed, pressing the red pushbutton (Red-PB) will turn on both motor one (M1) and two (M2). If TSW is open, pressing Red-PB will only turn on M2. If TSW is closed and the green pushbutton (Green-PB) is depressed once, M1 will run. Closing the temperature switch turns on the white pilot light.
- 4- Draw the Ladder diagram for the following operations:
 - a. When switch one (SW1) is closed, the green pilot light turns on.
 - b. When switch two (SW2) is closed, the yellow pilot light turns on.
 - c. When both SW1 and SW2 are closed, the green and yellow pilot lights turn off, and the red and white pilot lights turn on.
- 5- Draw the ladder diagram to represent the following operations:
 - a. Two switches are normally open and both have to be closed for a motor to operate.
 - b. Either of two, normally open, switches has to be closed for a coil to be energized and operate an actuator.
 - c. A motor is switched on by pressing a spring-return push button start switch, and the motor remains on until another spring-return push button stop switch is pressed.
 - d. A lamp is to be switched on if there is an input from sensor A or sensor B.
 - e. A light is to come on if there is no input to a sensor.
 - f. A solenoid valve is to be activated if sensor A gives an input.

6- Draw the Ladder diagram for the following **Steam Cooker application**:

- a. The start button (x4) is momentarily closed, starting the pump (y1).
- b. The tank fills, activating first the low-level sensor (x3), then the high-level sensor (x1).
- c. Then the pump stops.
- d. The steam valve (y2) opens, raising the temperature until the temperature switch (x2) is activated.
- e. The drain valve (y3) opens and the tank empties, de-activating first the high-level, then the low-level sensor. Then the drain valve closes.
- f. Steps a-e are repeated.

